OZONE ADVISORY PROGRAM AT MAMMOTH CAVE NATIONAL PARK

I. Subject: Ozone Advisory Procedures

II. Purpose: To provide guidance in notifying visitors, employees, and the media when ozone exceeds or is expected to exceed unhealthy levels.

III. Scope: This standard operating procedure applies to all park employees and visitors for their personal safety. It also establishes a means to inform visitors when ozone exceeds or is forecasted to exceed unhealthy levels.

IV. Policy: National Park Service (NPS) 2000 Management Policy states: "The National Park Service will seek to perpetuate the best possible air quality in parks because of its importance to visitor enjoyment, human health, scenic vistas, and the preservation of natural systems…" (Chapter 4 section 4.7.1), and "…efforts will be made to provide for persons' safety and health through other controls, including closures, guarding, signing, or other forms of education." (Chapter 8 section 8.2.5.1). In April 1999, the Associate Director, Natural Resource Stewardship and Science for the NPS, issued guidance for ozone public health advisories for all NPS areas.

According to the U.S. Environmental Protection Agency (EPA), ozone is one of the most serious and pervasive air pollutants in the United States that causes breathing problems in people (See EPA Fact Sheet, Appendix A). A powerful oxidant, ozone is capable of destroying organic matter - including human lung and airway tissue; it essentially burns through cell walls, and it is capable of doing this to healthy, non-smoking adults at ambient levels frequently encountered in this Park. The EPA has also identified three groups of people who are at particular risk from high ozone levels:

1. People with pre-existing respiratory problems such as emphysema, asthma, and chronic bronchitis.
2. A subgroup of the generally healthy people referred to as "responders" who suffer significantly greater losses in lung function than the rest of the population.
3. Individuals, who engage in physical activity outdoors such as athletes, construction workers, and children at play, and who respond more severely to ozone exposure than people at rest.

In July 1997, the EPA revised the National Ambient Air Quality Standard (NAAQS) for ozone. The new federal ozone standard is now 85 parts per billion (ppb) which, when exceeded (8-hour average greater than or equal to 85 ppb), indicates unhealthy ozone levels for people. The advisory program at Mammoth Cave National Park will be primarily based on data collected from the park ozone monitor and next-day ozone forecasts from the National Oceanic and Atmospheric Administration (NOAA). In 1999, the EPA revised the air quality index, which now includes a sub-index for 8-hour average ozone concentrations.

V. PROCEDURES DURING UNHEALTHY OZONE LEVELS: During the park's ozone season (March 1 - October 31), the Air Resources Specialist will be responsible for coordinating the Ozone Advisory Program. Ozone concentrations will be monitored daily and advisories issued as detailed below. The ozone advisory program at the Park will be timely and easily understood by Park staff and visitors. The Air Resource Specialist or designee will track ozone levels during the ozone season from the Park's ozone monitor. Although ozone can reach unhealthy levels at any hour of the day or night, tracking and reporting ozone conditions in the Park will normally occur from 8:00 a.m. to 4:00 p.m. CDT. If the current day's average ozone exposure, as of 9:00 a.m., exceeded or is expected to exceed the federal public health standard of 85 ppb for 8-hours, an ozone advisory will be issued that day. If the average ozone exposure in the Park exceeds the standard by 4:00 p.m. and the forecasted meteorological conditions (e.g., hot ambient temperatures, and calm winds) and ozone exposures are likely to continue the following day, an ozone advisory will be issued for the next day. If ozone levels exceeded the standard the previous day and weather patterns are conducive to high ozone levels, an advisory will be issued for the current day. If any of these conditions occur, the following procedures will be initiated:

1. When the Park's ozone monitor indicates ozone levels have reached unhealthy levels (three consecutive hours or an 8-hour average ozone concentration ≥ 85 parts per billion (ppb)), the Air Resource Specialist will notify offices and personnel listed below (see #2). A Park-wide administrative message advising all employees of the unhealthy ozone levels will be issued utilizing the park radio system.

   Recommended message: "Ozone pollution conditions in the Park have reached or are expected to reach unhealthy levels. An ozone health advisory has been issued for today (and/or tomorrow, only if forecasted by Air Resource Specialist). Park staff should avoid or limit strenuous or prolonged physical outdoor activities. Persons with respiratory ailments should limit their exposure and outside physical activities by staying indoors until levels have dropped below the unhealthy level. Please consult your supervisor for guidance on work activities".

2. The Air Resource Specialist will also make notification of unhealthy levels to the following offices in or personnel in the following order:

   a. Superintendent
   b. Safety Officer
   c. Chief, Division of Ranger Activities
   d. Concessions
   e. Kentucky Division for Air Quality
   f. Division for External Programs and Media Relations
   g. All Remaining Divisions
   h. NPS Air Resources Division
   i. SERO Division for Science and Natural Resources

`

3. The Park Division for External Programs and Media Relations will also make notification of unhealthy levels to specific local media (e.g. newspapers, radio and TV stations) (see Appendix B for Press Release):

4. Division Chiefs will be responsible for advising their staffs of appropriate precautions to take while at work during the ozone health advisory. Unhealthy ozone levels should be considered an environmental condition similar to excessive heat or cold. Supervisors should be aware of ozone effects and advise employees accordingly. Options available to supervisors include rescheduling physical outdoor activities and limiting the types and intensity of strenuous work (e.g., taking more frequent rest breaks and scheduling easy to moderate exertion activities that do not require accelerated heart rates and heavy breathing).

5. All Park employees who have contact with or are contacted by visitors should be able to inform them of unhealthy ozone conditions.

6. The morning following the announcement (by 10 a.m. CDT) of an ozone advisory, the Air Resource Specialist will make a determination as to the continuation or termination of the advisory. If it is appropriate for the advisory to remain in effect, the Air Resource Specialist will contact the offices and personnel, as described in #1 above. If it is appropriate to terminate the ozone advisory a Park-wide message stating that "the ozone pollution levels in the Park are no longer considered unhealthy and the ozone advisory has been terminated".

VI. RESPONSIBILITIES:

All Supervisors - Park supervisors should be aware of ozone effects (shortness of breath, coughing, wheezing, chest pain when breathing deeply, and scratchy eyes nose and throat) and the types of people at risk (people with pre-existing health problems, children, elderly adults, and active healthy people) and advise employees accordingly (see step #4 above). If field crews are experiencing health effects from high ozone levels, they should moderate their work activities in much the same manner as they do when weather conditions are extremely hot or cold.

Air Resource Specialist – The Specialist is responsible for the Ozone Advisory Program and its implementation. The position is responsible for the operation, maintenance, calibration and certification of the Park's ozone monitors. The position provides information to Park staff on the advisory program and effects of ozone. Responds to inquiries, and keeps the State, WASO Air Quality Division, Southeast Regional Office, and the Media Relations Office apprised of the program.

Division Chiefs - Assure Ozone Advisory Program compliance within Divisions. They are responsible for implementing Park policy and executing appropriate action to be taken by Division staff during unhealthy ozone levels.

Media Relations Officer – Is responsible for contacting the designated newspapers and radio stations during and after unhealthy ozone levels.

Park Safety Officer - Incorporates the Ozone Advisory Program into the Park's Safety Program and assists the Air Resource Specialist with coordination, implementation, and training.

Employees – Are responsible for communicating to visitors, when asked by visitors, information on ozone advisories and appropriate precautions to take during periods of unhealthy ozone levels.

NPS Air Resources Division - Provides overall program guidance and support to the Park Ozone Advisory Program.

Approved: _____ Date: _____

Ronald R. Switzer, Superintendent

Appendix A

United States Environmental Protection Agency
Office of Air & Radiation
Office of Air Quality Planning & Standards

FACT SHEET
July 17, 1997

HEALTH AND ENVIRONMENTAL EFFECTS OF GROUND-LEVEL OZONE

1. Why are We Concerned about Ground-Level Ozone?

Ozone is the prime ingredient of smog in our cities and other areas of the country. Though it occurs naturally in the stratosphere to provide a protective layer high above the earth, at ground-level it is the prime ingredient of smog. When inhaled, even at very low levels, ozone can:

- cause acute respiratory problems;
- aggravate asthma;
- cause significant temporary decreases in lung capacity of 15 to over 20 percent in some healthy adults;
- cause inflammation of lung tissue;
- lead to hospital admissions and emergency room visits (10 to 20 percent of all summertime respiratory-related hospital visits in the northeastern U.S. are associated with ozone pollution); and
- impair the body's immune system defenses, making people more susceptible to respiratory illnesses, including bronchitis and pneumonia.

2. Who is Most at Risk from Exposure to Ground-Level Ozone?

Children are most at risk from exposure to ozone:

- The average adult breathes 13,000 liters of air per day. Children breathe even more air per pound of body weight than adults do.
- Because children's respiratory systems are still developing, they are more susceptible than adults to environmental threats.
- Ground-level ozone is a summertime problem. Children are outside playing and exercising during the summer months at summer camps, playgrounds, neighborhood parks and in backyards.

3. Asthmatics and Asthmatic Children:

- Asthma is a growing threat to children and adults. Children make up 25 percent of the population and comprise 40 percent of the asthma cases.
- Fourteen Americans die every day from asthma, a rate three times greater than just 20 years ago. African-Americans die at a rate six times that of Caucasians.
- For asthmatics having an attack, the pathways of the lungs become so narrow that breathing becomes akin to sucking a thick milk shake through a straw.

- Ozone can aggravate asthma, causing more asthma attacks, increased use of medication, more medical treatment and more visits to hospital emergency clinics.

4. Healthy Adults:

- Even moderately exercising healthy adults can experience 15 to over 20 percent reductions in lung function from exposure to low levels of ozone over several hours.
- Damage to lung tissue may be caused by repeated exposures to ozone—something like repeated sunburns of the lungs—and this could result in a reduced quality of life as people age.
- Results of animal studies indicate that repeated exposure to high levels of ozone for several months or more can produce permanent structural damage in the lungs.
- Among those most at risk to ozone are people who are outdoors and moderately exercising during the summer months. This includes construction workers and other outdoor workers.

5. How does Ground-Level Ozone Harm the Environment?

- Ground-level ozone interferes with the ability of plants to produce and store food, so that growth, reproduction and overall plant health are compromised.
- By weakening sensitive vegetation, ozone makes plants more susceptible to disease, pests, and environmental stresses.
- Ground-level ozone has been shown to reduce agricultural yields for many economically important crops (e.g., soybeans, kidney beans, wheat, and cotton).
- The effects of ground-level ozone on long-lived species such as trees are believed to add up over many years so that whole forests or ecosystems can be affected. For example, ozone can adversely impact ecological functions such as water movement, mineral nutrient cycling, and habitats for various animal and plant species.
- Ground-level ozone can kill or damage leaves so that they fall off the plants too soon or become spotted or brown.
- These effects can significantly decrease the natural beauty of an area, such as in national parks and recreation areas.
- One of the key components of ozone, nitrogen oxides, contributes to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay.

6. What Improvement Would Result from EPA’s New Standards?

EPA’s new ozone standards will provide increased protection beyond that provided by the previous standard from the following effects:

- Reduced risk of significant decreases (15% to over 20%) in children’s lung functions (such as difficulty in breathing or shortness of breath), approximately 1 million fewer incidences each year, which can limit a healthy child’s activities or result in increased medication use, or medical treatment, for children with asthma.

- Reduced risk of moderate to severe respiratory symptoms in children, hundreds of thousands of fewer incidences each year of symptoms such as aggravated coughing and difficult or painful breathing.
- Reduced risk of hospital admissions and emergency room visits for respiratory causes, thousands fewer admissions and visits for individuals with asthma.
- Reduced risks of more frequent childhood illnesses and more subtle effects such as repeated inflammation of the lung, impairment of the lung's natural defense mechanisms,
increased susceptibility to respiratory infection, and irreversible changes in lung structure. Such risks can lead to chronic respiratory illnesses such as emphysema and chronic bronchitis later in life and/or premature aging of the lungs.
- Reduce the yield loss of major agricultural crops, such as soybeans and wheat, and commercial forests by almost $500 million.

7. Background: What is Ground-level Ozone?

- Ozone is not emitted directly into the air, but is formed by gases called nitrogen oxides (NOx) and volatile organic compounds (VOCs) that, in the presence of heat and sunlight,
react to form ozone. Ground-level ozone forms readily in the atmosphere, usually during hot weather.
- NOx is emitted from motor vehicles, power plants and other sources of combustion. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants,
refineries, factories, consumer and commercial products, and other industrial sources.
- Changing weather patterns contribute to yearly differences in ozone concentrations from city to city. Also, ozone and the pollutants that cause ozone can be carried to an area from pollution sources located hundreds of miles upwind.

Appendix B

Date:

For Information:

Media Advisory - For Immediate Release

Ozone Pollution Advisory Issued for Mammoth Cave National Park

Mammoth Cave National Park officials issued an advisory that the level of ground-level ozone pollution at the Park reached a level that poses a threat to the health of Park visitors. They advise that visitors may wish to refrain from strenuous outdoor activities while this condition is in effect. People with respiratory problems, especially, should limit their outdoor activity until ozone pollution levels have dropped below the National Ambient Air Quality Standard.

Park officials advise that the peak 8-hour average ozone concentration measured today at the Park's air quality monitoring station reached (???) parts per billion (ppb). Under federal and state standards in Kentucky, an 8-hour average ozone concentration of 85 ppb or greater is considered unhealthy to certain people.

The U.S. Environmental Protection Agency has identified several groups of people who are at risk from ozone exposure: (1) those with respiratory problems such as emphysema, asthma, and chronic bronchitis; (2) individuals engaging in strenuous outdoor exercise either recreationally or at work, as well as children at play; and (3) a few otherwise healthy individuals who are especially sensitive to ozone and suffer greater loss of lung function than the general population.

Park officials say that this is the (??) unhealthy day that the Park has documented in 2000. Natural ozone levels are estimated to be between 20-50 ppb.

For more information, contact: Superintendent, Mammoth Cave National Park, P.O. Box 7, Mammoth Cave, Kentucky 42259 (270) 758-2254.

* * NPS * * *